General Physics I: administrative information (112--1)

Course [PHY102E] General Physics I (Mechanics), Wednesday 9:10–12:00.

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Office hours Tuesdays and Fridays, 15:00–17:00. 理SC 2006–1.

Webpage https://www2.nsysu.edu.tw/iwamoto/gp1.html

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Evaluation Midterm and term exams (mandatory) and in-class activities (optional). With midterm- and term-exam scores A and B (out of 50 each) and in-class-activity score C (max 30), the grade is given by $\max[A+B, f(A+B+C)]$, where $f(x) = 0.58x + 25$ (half-up rounding).

Themes and topics

An introductory course to University Physics, where students are expected to comprehend fundamental concepts in physics but also learn how to study physical science in university individually based on English textbooks.

You think about yourself and **how you can learn physics efficiently** so that you make your NSYSU life more enjoyable and satisfactory. Throughout this semester, you try to build your way of learning, where you need to **learn proactively** by utilizing lectures and books given in English.

This lecture's second goal is to learn **fundamental concepts** in physics, such as energy and force. Toward the goal, you begin with **basic calculus and vector arithmetic**: you learn differentials, essential integrals, and calculations with vectors. Using those tools, you analyze **three-dimensional motions of particles**, where you encounter the fundamental concepts, notice their usefulness, and comprehend their meanings.

The tools and concepts you learn are further utilized in future lectures, such as General Physics 2 (electromagnetism and oscillatory motions), electromagnetism, and electronics.

> *This course is planned as a one-year course. Students who want to take General Physics 2 by Sho Iwamoto should take this course.*

Textbook

Serway & Jewett, *Physics for Scientists and Engineers with Modern Physics*, 10th ed. Cengage Learning.

- This course corresponds to Chapters 1–13 (Volume 1), while we will discuss Chapters 15–17 and 22–33 in the next semester.
- We use this book in in-class activities (preferably a physical book rather than an e-book).

Other references

[YF] Young & Freedman, *University Physics*, 15th ed. Pearson.

[Wo] Wolfson, *Essential University Physics*, 4th ed. Pearson.

[Op] Ling et al., *University Physics, Vol. 1*. OpenStax.
https://openstax.org/details/books/university-physics-volume-1

You do not need them. Instead, stick to the textbook (Serway&Jewett) at this stage. This list is only for informational purposes.

Student's goals

At the end of this course,

- I know how to study at the university. I have "my way of learning" customized for my personality and cognitive characteristics.
- I know how to study efficiently, proactively, and individually based on English textbooks.
- I can perfectly handle quantities with physical units without confusing vectors and scalars.
- I am familiar with differentials, integrals, and vector arithmetic, and can use them to analyze three-dimensional motions.
- I can explain "energy", "work", "potential", "momentum", and relations among them.
- I can find and describe forces in a system with multiple rigid objects.

Schedule

9.06	⟨1⟩	Units. Basic Math. (+ How to Learn)	§1.1, 1.3–5, B.1–4
9.13	⟨2⟩	1D-Motion. (+ How to Read a Textbook)	§2, B.6
9.20	⟨3⟩	Integrals. Vectors. (+ How to Attend Lectures)	§3, B.7
9.27	⟨4⟩	2D-Motion.	§4
10.04	⟨5⟩	Force. Newton's Laws. Frictions.	§5
10.11	⟨6⟩	Circular Motion. Frame. Fictitious Force.	§6
10.18	⟨7⟩	Series Expansion. Significant Figures and Uncertainties.	§1.6, B.5, B.8
10.25	**Mid-term Exam**		
11.01	⟨8⟩	Work and Energy. (+ Exam Review)	§7
11.08	⟨9⟩	Energy. Potential.	§7–8
11.15	⟨10⟩	Energy Conservation. Conservative Force. Power.	§8
11.22	⟨11⟩	Momentum. Impulse. Elastic Collision. Center of Mass.	§9
11.29	⟨12⟩	Angular Velocity and Angular Acceleration. Torque.	§10
12.06	⟨13⟩	Angular Momentum.	§11
12.13	⟨14⟩	Rigid Objects.	§12
12.20	**Term Exam**		
12.27	⟨15⟩	Gravity. (+ Exam Review)	§13
1.03	⟨16⟩	Gravity and Coulomb's Force.	§13, 22
Next semester:		Oscillatory Motion and Waves.	§15–17
		Electrostatics.	§22–26
		Magnetism. Maxwell's Equations. Electromagnetic Waves.	§28–31, 33

The classes ⟨15⟩ and ⟨16⟩ are not included in the evaluation of *this* course. However, if you are absent, you may experience difficulties in the next semester.

(1) Introduction of Lecturer and TA

(2) University Principles

1. **No longer kids**. We are colleagues.
2. Learn by yourself. **You'll never be taught.**
   - I don't teach. I'm not your teacher 老師 but lecturer 講師.
   - ★ 1 credit (學分) = (50 minute lecture + 100 minute self-study) of 18 weeks.
3. Do own duty.
   - I do lectures and get salary. You get ≥ 60 points in exams/activities and receive credits.
   - ★ "Teach you physics" is not my duty. "Attend lectures" is not your duty.
4. Ask for help. Friends, colleagues, professors, secretaries, TA, ...
   - **Nobody helps you** if you don't ask for help. Everyone will help you if you ask.
   - ★ Take care of **mental health**, money, academic honesty, credit, and colleagues/family.
5. Bilingual 2030 + New Curriculum 108.

Hint: Visit professors anytime. Especially, during their office hours, they are waiting for you.

(3) On This Course

3.1 Administrative Information

→ see Page 1 of syllabus.

3.2 Objectives

- 材光/光電's most important course: Electromagnetism (2nd-year, two semesters).
  - Mathematics: Vector calculus = **differentials** and **integrals** of **vectors**.
  - Physics: Quantities with **units**. Concepts such as **force**, **energy**, **work**.
- Preparation for *"Preparation for Electromagnetism (= General Physics 2)"*
  - Mathematics, physics, and ⟪how to learn by yourselves⟫.

3.3 Evaluation and Make-up Principles

- Two exams: mandatory, 50 points each.[*1]
  - If you have reasons for absence, you must follow *Regulations for Leave Application*[*2]. Otherwise, your grade will be **X**.
- In-class activities: Max 30 points. Not mandatory. (Some points may be given by Sho's descretion.)
  - Make-up will be provided for official leaves 公假 or COVID-19 if officially applied.[*3]
  - No make-ups for other health problems. Other reasons are on a case-by-case basis.
- See *NSYSU Guidelines for Evaluation*[*4] for grading system.

Hint: For Grade **C**−, get ≥ 59.5 points out of 130 [= 50 (midterm) + 50 (term) + 30 (activity)].
If you want **A**−, get ≥ 94.0 points out of 130, or get ≥ 79.5 out of 100 (two exams).

[*1] Midterm exam will cover class ⟨1⟩ to ⟨7⟩ with closed-book style (no textbook, no notebook, no calculator, no tablet, no discussion). The term exam will cover class ⟨1⟩ to ⟨14⟩, and closed-book but you will be allowed to bring-in one sheet of paper (maximum A4-sized) as a cheat-sheet. However, these plans may be changed.

[*2] 學生考試請假及補考辦法 https://oaa.nsysu.edu.tw/var/file/3/1003/img/1296/acade_rule_09.pdf
[*3] https://sis.nsysu.edu.tw/main.php
[*4] 學生成績作業要點 https://oaa.nsysu.edu.tw/var/file/3/1003/img/1296/acade_rule_32.pdf

3.4 Textbook

- **Please get the textbook**. From next week we will use the book in activities.
  - Volume 1 for this semester, volume 2 for the next semester.
- Around NT$1300 for Vol. 1+2. Contact Mr. Yi Ling Hsu [許益凌] TEL:0919–121727. https://tsanghai.com.tw/book_detail.php?c=264&no=3826
- Physical vs e-book?
  - Physical → Heavy. (→ iron technique?)
  - E-book → Difficulty in jumping. You will be **disturbed**.

Hint: In some activities, you can use only physical books (to refrain you from using the internet.)

3.5 Lecture

Principles: (1) We are colleagues, so we create lecture together.

(2) You are adult, so you can do anything except for disturbing me.
Conflicts between students are to be solved by students.

3.5.1 Lecture Rules

- **You must interrupt Sho** if you have questions/comments. [*5]
- You can drink water/non-alcoholic beverage or eat small candies/gums/chocolates (as long as room-regulation allows).
- In principle, you can use computers, tablets, smartphones, etc.
  - It will disturb your concentration. It is your own risk.
  - It may be forbidden in some activities.
- Do not eat "foods." Do not drink alcohol.
- Do not talk over phones.
- **[VOTE]** Should we kick-out students who are talking with others during lectures?

3.5.2 In-class Activity

- Every week you may get a few points. The sum is counted in the evaluation (but max 30).
- You cannot get good score if you are late or you did not do the **minimal homework**.
- Sho does not prepare solutions. **Share your solution** to others.

3.5.3 Lecture

Standard blackboard lecture, but Sho does not give you slides or lecture notes.

- Take notes by yourself. Learn how to take notes, and share your notes with others.
- To understand English lectures, you need to do **preview** as well as the **minimal homework**.

[VOTE] Do you want to have a LINE Open Chat (anonymous 匿名) for this course?[*6]

[*5] You should think this is **your duty** in all university lectures. Our job is not to finish the materials but to help you learn. Furthermore, you can help other students by asking questions! When you have questions, usually others have the same one (and it is Sho's fault). It also helps Sho, because Sho can improve the lecture.

[*6] Sho does not want to have a non-anonymous 實名 group; the chat should be *unofficial*, so the TA will moderate it (and Sho will be also anonymous).

3.6 Your study at home

- Preview of textbook : To listen English lectures. (very important for L2-learner)
- Review : To understand physics.
- Homework : To be ready for in-class activities. (very important in physics)
- More problem solving : To prepare for exams.

We will discuss how to preview/review in the next week.

3.7 Your goals

- Get used to university = Learn *how to learn*.
  - Lectures: Preview + Attendance + Review.
  - Self-study: Scheduling. Read the textbook.
  - Help each other: Office hours. Share your note. Share your solution.
- Essential math: differentials, integrals, vectors.
  - Global standard of science students: Able to caucluate differentials of *any* functions.
- Essential phys:
  - Quantity with unit.
  - Fundamental concepts: force, energy, momentum, angular momentum, ...

3.8 Other Remarks

Scientific remarks

- This course uses the SI unit system.
- The difference between Sho's and Textbook's notation: (You can use either.)
  - Cartesian unit vectors: $\boldsymbol{e}_x, \boldsymbol{e}_y, \boldsymbol{e}_z$ vs $\hat{\mathbf{i}}, \hat{\mathbf{j}}, \hat{\mathbf{k}}$
  - elementary charge: $|e|$ vs e $(= 1.602\,176\,634 \times 10^{-19}\ \mathrm{C})$[*7]
- Sho always writes "$\log_{10}$" for base-10 logarithm and *tries to* use "ln" for natural logarithm. Please ask when ambiguous.

Administrative remarks

- You are very welcome to visit Sho during the **office hours**, but also in any other time. He is willing to help you learn electromagnetism, but also other physics, mathematics, or anything.
- Sho is extraordinarily strict against **plagiarism**.
  - Please read NSYSU's *Guidelines for Students' Academic Ethics and Handling of Cases in Violation of the Academic Ethics*. The guidelines, in particular Article II (3), (4), and (6), are taken into account when Sho evaluates students' reports or exam/quiz answers.[*8]

[*7] The SI unit system was updated in 2019. Since then, this equation gives the definition of Coulomb "C" and thus this is an exact relation. Most of books, including the textbook (10th ed.), use old versions of the SI, in which the value of $|e|$ was determined by measurements.

[*8] An example: Imagine you are writing a report. If you "use" some books or others' reports, you must write so. If you had a discussion with others, you must write so.

(4) Sho's Suggestions

Hint: These are very subjective. No need to follow. Decide by yourself.

General Learning method

- Buy a physical textbook. Prepare a physical notebook.
  - You are busy in adopting to university life. You don't have time to adopt to e-book. Stick to your old style for now. Try using new tools after you are used to university.
  - Is it expensive? Yes, but you can work more efficiently with physical books. Young days are precious. Don't waste your time by saving NT$1300.
- Always try to improve your learning method. You are going to learn for more than 50 years.
- Look for "learning tips" on the internet. For example,
  - https://www.cmu.edu/student-success/other-resources/fast-facts/succeed-in-physics.pdf
  - https://www.wikihow.com/Learn-Physics
  - https://www2.oberlin.edu/physics/dstyer/StudyTips.html
- Make a week timetable 課表 including home-study. Decide how many hours you study for each course.

Learning Physics

- **Distinguish vectors from scalars. Never forget units.**
- Don't try hard: study efficiently and cleverly. Don't give up: study steadily.
  - Physics is 頓悟, therefore difficult. I needed a few years to understand some concepts.
  - Discuss with friends, which will help your understanding.
- Don't try to calculate quickly. **Mistake-in-calculation is the worst mistake.**
- Don't solve problems first. Do it after you understand related concepts.
  - In high school, you could develop your understanding by solving problems. In university, it does not happen because each concept is more abstract and more complicated.

During Lectures

- **Never hesitate to ask questions.**
- **Ask questions immediately when you have a question.**
- Come before 9:05am.
  - Sho could *never* attend the lecture starting at 9am when he was undergrad. Therefore, Sho has a huge respect to students coming at that early morning.
- Take note. Develop your note-taking skill, which you will employ for more than 30 years.

Work Together

- **Never hesitate to ask questions.**
- Ask for others' note if you missed to take it.
- Ask for others' solution for in-class activities if you are not confident.
- Visit Sho during office hours. Usually he is bored 無聊/寂寞 during office hours.